AMENDMENTS TO THE CLAIMS

Claims 1-71 are currently pending in the present application. By this amendment, Claim 61 is canceled and new Claims 72-82 are presented. This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims

1. (currently amended) A nanocomposite resist comprising:

a nanoparticle component; and

a polymer component;

wherein the nanocomposite resist is photoimageable.

2. (original) The nanocomposite resist of Claim 1, wherein the nanoparticle component comprises a boride, carbide, silicide, nitride, phosphide, arsenide, oxide, sulfide, selenide, telluride, fluoride, chloride, bromide, iodide, or combinations thereof.

3. (original) The nanocomposite resist of Claim 1, wherein the polymer component comprises a polymer that undergoes chain scission upon exposure to electron beam irradiation.

4. (original) The nanocomposite resist of Claim 1, wherein the polymer component comprises poly(α-chloroacrylate-*co*-α-methyl styrene), poly(2,2,2-trifluoroethyl-α-chloroacrylate), poly(methyl methacrylate), poly(butene sulfone), polysilanes, polyacetals, or combinations thereof.

5. (original) The nanocomposite resist of Claim 1, wherein the nanoparticle component comprises a nanoparticle having an average diameter less than about 100 nanometers.

6. (original) The nanocomposite resist of Claim 5, wherein the nanoparticle has an average diameter less than about 10 nanometers.

7. (original) The nanocomposite resist of Claim 6, wherein the nanoparticle has an average diameter less than about 2 nanometers.

8. (original) The nanocomposite resist of Claim 1, wherein the nanoparticle component comprises an oxide of silicon, aluminum, titanium, zirconium, iron, antimony, tin, cerium, barium, manganese, vanadium, chromium, lead, copper, indium, yttrium, zinc, mixed oxides thereof, or combinations thereof.

9. (original) The nanocomposite resist of Claim 1, wherein the nanoparticle component comprises a polyhedral oligosilsesquioxane.

10. (original) The nanocomposite resist of Claim 9, wherein the polyhedral oligosilsesquioxane comprises a compound of formula $Si_8O_{12}(OR)_8$, $Si_8O_{12}R_8$, $Si_{12}O_{18}(OR)_{12}$, or $Si_{12}O_{18}R_{12}$, wherein R is selected from alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, silyl, substituted silyl, aryl, substituted aryl, aralkyl, substituted aralkyl, alkenyl, or substituted alkenyl.

11. (original) The nanocomposite resist of Claim 9, wherein the polymer component comprises poly(α-chloroacrylate-*co*-α-methyl styrene).

12. (currently amended) The nanocomposite resist of Claim 1, wherein the resist comprises ~~nanoparticle component is present in the resist from~~ about 1% to about 50% by weight the nanoparticle component.

13. (original) The nanocomposite resist of Claim 1, wherein the resist has a glass transition temperature of at least about 160°C.

14. (currently amended) A lithographic process comprising:

exposing a lithographic recording medium to radiation to form a pattern; and

developing the pattern;

wherein the lithographic recording medium comprises the nanocomposite resist of Claim 1.

15. (original) The lithographic process of Claim 14, wherein the nanoparticle component comprises an oxide of silicon, aluminum, titanium, zirconium, iron, antimony, tin, cerium, barium, manganese, vanadium, chromium, lead, copper, indium, yttrium, zinc, mixed oxides thereof, or combinations thereof.

16. (original) The lithographic process of Claim 14, wherein the nanoparticle component comprises a polyhedral oligosilsesquioxane.

17. (original) The lithographic process of Claim 14, wherein the polymer component comprises poly(α-chloroacrylate-*co*-α-methyl styrene), poly(2,2,2-trifluoroethyl-α-chloroacrylate), poly(methyl methacrylate), poly(butene sulfone), polysilanes, polyacetals, or combinations thereof.

18. (original) The lithographic process of Claim 14, wherein the nanocomposite resist comprises poly(α-chloroacrylate-*co*-α-methyl styrene) and the nanoparticle component comprises a polyhedral oligosilsesquioxane.

19. (original) An integrated circuit prepared by the lithographic process of Claim 14.

20. (currently amended) ~~An electron beam~~ The lithographic process of Claim 14, wherein ~~the lithographic recording medium comprises the nanoparticle resist of Claim 1~~ the radiation comprises an electron beam.

21. (currently amended) ~~An ion beam~~ The lithographic process of Claim 14, wherein ~~the lithographic recording medium comprises the nanoparticle resist of Claim 1~~ the radiation comprises an ion beam.

22. (currently amended) A polymeric chemically amplified resist comprising:

a methacrylate component comprising at least one methacrylate-containing comonomer; and

a polyhedral oligosilsequioxane component comprising at least one polyhedral oligosilsequioxane-containing comonomer;

wherein the methacrylate-containing comonomer is different than the polyhedral oligosilsequioxane-containing comonomer.

23. (original) The polymeric chemically amplified resist of Claim 22, wherein the methacrylate component comprises methyl methacrylate, t-butyl methacrylate, methacrylic acid, or combinations thereof.

24. (original) The polymeric chemically amplified resist of Claim 22, wherein the polyhedral oligosilsequioxane component comprises 3-(3,5,7,9,11,13,15-heptacyclopentylpentacyclo-[9.5.1.1^{3,9}.1^{5,15}.1^{7,13}]octasiloxane-1-yl)propyl methacrylate; 3-[(3,5,7,9,11,13,15-heptacyclopentylpentacyclo-[9.5.1.1^{3,9}.1^{5,15}.1^{7,13}]octasiloxan-1-yloxy)dimethylsilyl]propyl methacrylate; 1,3,5,7,9,11,13-heptacyclopentyl-15vinylpentacyclo-[9.5.1.1^{3,9}.1^{5,15}.1^{7,13}]octasiloxane, or combinations thereof.

25. (currently amended) The polymeric chemically amplified resist of Claim 22, wherein the polymer comprises 1% to about 40% by weight the polyhedral oligosilsequioxane component ~~is present from about 1% to about 40% by weight in the polymer~~.

26. (original) The polymeric chemically amplified resist of Claim 22, wherein the polymeric resist has a glass transition temperature greater than about 165°C.

27. (original) The polymeric chemically amplified resist of Claim 22, wherein the polymeric resist has a weight-average molecular weight greater than about 100,000 g/mol.

28. (original) The polymeric chemically amplified resist of Claim 22, wherein the polymer has a polydispersity index between 1 and about 2.

29. (original) A polymeric chemically amplified resist comprising methyl methacrylate, t-butyl methacrylate, methacrylic acid, and 3-(3,5,7,9,11,13,15-heptacyclopentylpentacyclo-[9.5.1.$1^{3,9}$.$1^{5,15}$.$1^{7,13}$]octasiloxane-1-yl)propyl methacrylate.

30. (currently amended) A lithographic process comprising:

exposing a lithographic recording medium to radiation to form a pattern; and

developing the pattern;

wherein the lithographic recording medium comprises the polymeric chemically amplified resist of Claim 22.

31. (original) The lithographic process of Claim 30, wherein the methacrylate component comprises methyl methacrylate, t-butyl methacrylate, methacrylic acid, or combinations thereof.

32. (original) The lithographic process of Claim 30, wherein the polyhedral oligosilsequioxane component comprises 3-(3,5,7,9,11,13,15-heptacyclopentylpentacyclo-[9.5.1.$1^{3,9}$.$1^{5,15}$.$1^{7,13}$]octasiloxane-1-yl)propyl methacrylate; 3-[(3,5,7,9,11,13,15-heptacyclopentylpentacyclo-[9.5.1.$1^{3,9}$.$1^{5,15}$.$1^{7,13}$]octasiloxan-1-yloxy)dimethylsilyl]propyl methacrylate; 1,3,5,7,9,11,13-heptacyclopentyl-15vinylpentacyclo-[9.5.1.$1^{3,9}$.$1^{5,15}$.$1^{7,13}$]-octasiloxane, or combinations thereof.

33. (original) The lithographic process of Claim 30, wherein the polymeric chemically amplified resist comprises methyl methacrylate, t-butyl methacrylate, methacrylic acid, and 3-(3,5,7,9,11,13,15-heptacyclopentylpentacyclo-[9.5.1.$1^{3,9}$.$1^{5,15}$.$1^{7,13}$]octasiloxane-1-yl)propyl methacrylate.

34. (original) An integrated circuit prepared by the lithographic process of Claim 30.

35. (currently amended) ~~An electron beam~~ The lithographic process of Claim 30 wherein ~~the lithographic recording medium comprises the polymeric chemically amplified resist of Claim 22~~ the radiation comprises an electron beam.

36. (currently amended) ~~An ion beam~~ The lithographic process of Claim 30, wherein ~~the lithographic recording medium comprises the polymeric chemically amplified resist of Claim 22~~ the radiation comprises an ion beam.

37. (currently amended) ~~An X-ray~~ The lithographic process of Claim 30, wherein ~~the lithographic recording medium comprises the polymeric chemically amplified resist of Claim 22~~ the radiation comprises X-ray radiation.

38. (currently amended) A polymeric chemically amplified resist comprising:

a methacrylate component; and

a photoacid generating component.

39. (original) The polymeric chemically amplified resist of Claim 38, wherein the methacrylate component comprises methyl methacrylate, t-butyl methacrylate, methacrylic acid, or combinations thereof.

40. (original) The polymeric chemically amplified resist of Claim 38 further comprising a dissolution promoter.

41. (original) The polymeric chemically amplified resist of Claim 40 wherein the dissolution promoter comprises itaconic anhydride.

42. (original) The polymeric chemically amplified resist of Claim 38, wherein the photoacid generating component comprises a sulfonium compound, an ionium compound, or combinations thereof.

43. (original) The polymeric chemically amplified resist of Claim 38, wherein the photoacid generating component comprises [*p*-CH_2=$C(CH_3)C(O)OC_6H_4SMe_2$]OSO_2CF_3.

44. (original) The polymeric chemically amplified resist of Claim 38, further comprising a polyhedral oligosilsequioxane component.

45. (original) The polymeric chemically amplified resist of Claim 44, wherein the polyhedral oligosilsequioxane component comprises 3-(3,5,7,9,11,13,15-heptacyclopentylpentacyclo-[9.5.1.$1^{3,9}$.$1^{5,15}$.$1^{7,13}$]octasiloxane-1-yl)propyl methacrylate; 3-[(3,5,7,9,11,13,15-heptacyclopentylpentacyclo-[9.5.1.$1^{3,9}$.$1^{5,15}$.$1^{7,13}$]octasiloxan-1-yloxy)dimethylsilyl]propyl methacrylate; 1,3,5,7,9,11,13-heptacyclopentyl-15vinylpentacyclo-[9.5.1.$1^{3,9}$.$1^{5,15}$.$1^{7,13}$]octasiloxane, or combinations thereof.

46. (currently amended) The polymeric chemically amplified resist of Claim 44, wherein the polymer comprises about 1% to about 35% by weight the polyhedral oligosilsequioxane component ~~is present from about 1% to about 35% by weight in the polymer~~.

47. (original) The polymeric chemically amplified resist of Claim 38, wherein the polymer has a weight-average molecular weight between 20,000 to 100,000 g/mol.

48. (original) The polymeric chemically amplified resist of Claim 38, wherein the polymer has a polydispersity index between 1 and about 2.

49. (original) A polymeric chemically amplified resist comprising methyl methacrylate, t-butyl methacrylate, methacrylic acid, 3-(3,5,7,9,11,13,15-heptacyclopentylpentacyclo-[9.5.1.$1^{3,9}$.$1^{5,15}$.$1^{7,13}$]octasiloxane-1-yl)propyl methacrylate, and [*p*-CH_2=$C(CH_3)C(O)$-$OC_6H_4SMe_2$]OSO_2CF_3.

50. (original) The polymeric chemically amplified resist of Claim 49, further comprising itaconic anhydride.

51. (currently amended) A lithographic process comprising:

exposing a lithographic recording medium to radiation to form a pattern; and

developing the pattern;

wherein the lithographic recording medium comprises the polymeric chemically amplified resist of Claim 38.

52. (original) The lithographic process of Claim 51, wherein the methacrylate component comprises methyl methacrylate, t-butyl methacrylate, methacrylic acid, or combinations thereof.

53. (original) The lithographic process of Claim 51, wherein the polymeric chemically amplified resist further comprises a dissolution promoter.

54. (original) The lithographic process of Claim 53, wherein the dissolution promoter comprises itaconic anhydride.

55. (original) The lithographic process of Claim 51, wherein the photoacid generating component comprises a sulfonium compound, an ionium compound, or combinations thereof.

56. (original) The lithographic process of Claim 51, wherein the polyhedral oligosilsequioxane component comprises 3-(3,5,7,9,11,13,15-heptacyclopentylpentacyclo-[9.5.1.1^{3,9}.1^{5,15}.1^{7,13}]octasiloxane-1-yl)propyl methacrylate; 3-[(3,5,7,9,11,13,15-heptacyclopentylpentacyclo-[9.5.1.1^{3,9}.1^{5,15}.1^{7,13}]octasiloxan-1-yloxy)dimethylsilyl]propyl methacrylate; 1,3,5,7,9,11,13-heptacyclopentyl-15vinylpentacyclo-[9.5.1.1^{3,9}.1^{5,15}.1^{7,13}]-octasiloxane, or combinations thereof.

57. (original) An integrated circuit prepared by the lithographic process of Claim 51.

58. (currently amended) ~~An extreme ultraviolet~~ The lithographic process of Claim 51, wherein ~~the lithographic recording medium comprises the polymeric chemically amplified resist of Claim 38~~ the radiation comprises extreme ultraviolet radiation.

59. (currently amended) ~~An X-ray~~ The lithographic process of Claim 51, wherein ~~the lithographic recording medium comprises the polymeric chemically amplified resist of Claim 38~~ the radiation comprises X-ray radiation.

60. (currently amended) A polymeric lithographic resist comprising a photoacid generating component, wherein the photoacid generating component comprises a sulfonium compound, an ionium compound, or a combination thereof.

61. (canceled)

62. (original) The polymeric lithographic resist of Claim 60, wherein the photoacid generating component comprises $[p\text{-}CH_2{=}C(CH_3)C(O)OC_6H_4SMe_2]OSO_2CF_3$.

63. (currently amended) A lithographic process comprising:

exposing a lithographic recording medium to radiation to form a pattern; and

developing the pattern;

wherein the lithographic recording medium comprises the polymeric resist of Claim 60.

64. (original) An integrated circuit prepared by the lithographic process of Claim 63.

65. (original) A polymeric resist comprising:

a polyhedral oligosilsequioxane disilanol component; and

a polyacetal component.

66. (original) The polymeric resist of Claim 65, wherein the polyhedral oligosilsequioxane disilanol component comprises disilanol cyclopentyl POSS ($Si_8O_{11}(c\text{-}C_5H_9)_8(OH)_2$), disilanol isobutyl POSS ($Si_8O_{11}(i\text{-}C_4H_9)_8(OH)_2$), or dimethylphenyldisilanol cyclopentyl POSS ($Si_8O_9(c\text{-}C_5H_9)_7(OSiMe_2Ph)(OH)_2$), or a combination thereof.

67. (original) The polymeric resist of Claim 65, wherein the polyacetal component comprises a polymer of a halogen-substituted ketone or aldehyde.

68. (currently amended) The polymeric resist of Claim 65, wherein the polyacetal component comprises a polymer of hexafluoroacetone, trifluoroacetone, hexachloroacetone, trichloroacetone, trifluoroacetaldehyde, trichloroacetaldehyde, thiocarbonylfluoride, hexafluorothioacetone, mixtures thereof, ~~and~~ or derivatives thereof.

69. (currently amended) A lithographic process comprising:

exposing a lithographic recording medium to radiation to form a pattern; and

developing the pattern;

wherein the lithographic recording medium comprises the polymeric resist of Claim 65.

70. (currently amended) The lithographic process of Claim 69, wherein the lithographic process comprises ~~is~~ a 157 nm projection optical lithographic process.

71. (original) An integrated circuit prepared by the lithographic process of Claim 69.

72. (new) A nanocomposite resist comprising:

a nanoparticle component; and

a polymer component;

wherein the nanoparticle component comprises a boride, a carbide, a silicide, a nitride, a phosphide, an arsenide, an oxide other than a polyhedral oligosilsesquioxane, a sulfide, a selenide, a telluride, a fluoride, a chloride, a bromide, an iodide, or any combination thereof.

73. (new) A nanocomposite resist comprising:

a nanoparticle component; and

a polymer component;

wherein the polymer component comprises poly(α-chloroacrylate-*co*-α-methyl styrene), poly(2,2,2-trifluoroethyl-α-chloroacrylate), poly(methyl methacrylate), poly(butene sulfone), polyacetals, or combinations thereof.

74. (new) The lithographic process of Claim 14, wherein the nanoparticle component comprises a boride, carbide, silicide, nitride, phosphide, arsenide, oxide, sulfide, selenide, telluride, fluoride, chloride, bromide, iodide, or combinations thereof.

75. (new) The lithographic process of Claim 14, wherein the polymer component comprises a polymer that undergoes chain scission upon exposure to electron beam irradiation.

76. (new) The lithographic process of Claim 14, wherein the nanoparticle component comprises a nanoparticle having an average diameter less than about 100 nanometers.

77. (new) The lithographic process of Claim 14, wherein the nanoparticle has an average diameter less than about 10 nanometers.

78. (new) The lithographic process of Claim 14, wherein the nanoparticle has an average diameter less than about 2 nanometers.

79. (new) The lithographic process of Claim 14, wherein the polyhedral oligosilsesquioxane comprises a compound of formula $Si_8O_{12}(OR)_8$, $Si_8O_{12}R_8$, $Si_{12}O_{18}(OR)_{12}$, or $Si_{12}O_{18}R_{12}$, wherein R is selected from alkyl, substituted alkyl, cycloalkyl, substituted cycloalkyl, silyl, substituted silyl, aryl, substituted aryl, aralkyl, substituted aralkyl, alkenyl, or substituted alkenyl.

80. (new) The lithographic process of Claim 14, wherein the polymer component comprises poly(α-chloroacrylate-*co*-α-methyl styrene).

81. (new) The lithographic process of Claim 14, wherein the resist comprises from about 1% to about 50% by weight the nanoparticle component .

82. (new) The lithographic process of Claim 14, wherein the resist has a glass transition temperature of at least about 160°C.